



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/660,751

09/12/2003

Thomas D. Williams

E0214.0002

5984

24998 7590 11/20/2007
DICKSTEIN SHAPIRO LLP
1825 EYE STREET NW
Washington, DC 20006-5403

EXAMINER

PATEL, JAYESH A

ART UNIT	PAPER NUMBER
----------	--------------

2624

MAIL DATE	DELIVERY MODE
-----------	---------------

11/20/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/660,751	Applicant(s) WILLIAMS ET AL.	
	Examiner Jayesh A. Patel	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-17 is/are pending in the application.
- 4a) Of the above claim(s) 2 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 September 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>09/07/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

Response to Amendment

1. Amendments to claims have been entered and in view of the amendments new grounds of rejections have been introduced.
2. New grounds of rejections have therefore been presented.
3. Claims 1, 3-5 have been amended and Claim 2 is cancelled.
4. Claims 6-17 are newly added.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merchant (US 4635203) hereafter Merchant. in view of Hsu et al (6587601) hereafter Hsu.

1. Regarding Claim 1, Merchant discloses a method (**Figs 1,3a,3b and 4**) for creating a novel viewpoint image from a plurality of images, the method comprising simultaneously acquiring sets of images from a plurality of cameras (**as in Fig 3a,3b and Col 3 lines 25-33**). Merchant further discloses the correlation of one image with the warped image to achieve a common image

which is a image-to-image focal plane transformed (novel viewpoint), geometrical differences (misregistration) at (**Fig 4 and Col 1 Lines 46-67 through Col 2 Lines 1-41 and Col 3 Lines 46-49**). Merchant is silent and however does not however disclose using predetermined background based correspondence fields to detect novel objects; and assigning the image representations for these objects likely new correspondences; and using the resulting correspondences to, constructs a novel viewpoint image by warping at least one of the images. Wherein the novel viewpoint image corresponds to a view from a location different than a camera location.

Hsu discloses using predetermined background based correspondence fields to detect novel objects (**Figs 1-5, Col 1 Lines 52-55, Col 2 Lines 15-40, Col 3 Lines 55-56 and Col 4 lines 14-28**); and assigning the image representations for these objects likely new correspondences (**Col 5 lines 20-27**); and using the resulting correspondences to, construct a novel viewpoint image by warping at least one of the images (**Col 6 Lines 36-47, Col 13 Lines 58-65**), wherein the novel viewpoint image corresponds to a view from a location different than a camera location (**synthetic reference images from the perspective of the camera**). Hsu further discloses that a comprehensive view of the scene is produced at (**Col 4 Lines 27-28**). Hsu discloses that the reference image and the sensors images can be accurately aligned using the parametric transformation and the accuracy is up to a sub-pixel value at (**Col 2 lines 5-32**). Merchant and Hsu are from the same field of endeavor and are analogous art,

therefore it would have been obvious for one of ordinary skill in the art, at the time the invention was made to have used the teachings of Hsu in the method of merchant for the above reasons.

2. Regarding Claim 3, Merchant and Hsu discloses the method in claim 1. Hsu further discloses wherein assignment of image representation likely new correspondences is random at **(Col 5 Lines 20-30)**.

3. Regarding Claim 4, Merchant and Hsu discloses the method in claim 1. Hsu further disclose comprising; testing the likely new correspondences and refining the likely new correspondences based on a result of the testing at **(Col 13 lines 58-65 and Col 7 Lines 58-61)**.

4. Regarding Claim 5, Merchant and Hsu disclose the method in claim 1. Hsu further disclose wherein **[[: a.]]** parts of the scene that become visible in the novel viewpoint image for which no data are present in the image being warped because of occlusion in the said image being warped are provided by some other image from yet another viewpoint for which appropriate correspondences exist **(Col 5 lines 20-30)**.

5. Claim 13 is a corresponding system claim of the claim 1. See the explanation of Claim 1.

Claims 6-10 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Guo et al. (US 6353678) hereafter Guo in view of Hsu.

6. Regarding Claim 6, Guo discloses a method (**Figs 1-6**) for efficiently generating a novel viewpoint image of a scene, the method comprising: acquiring a pair of background images of the scene (**Fig 3 element 310**); acquiring a pair of real-time images of the scene (**Fig 3 Element 316**). Guo also discloses the correspondences of the frames and warping of images to detect independent motions (**movable objects**) at (**Fig 4, Col 8 Lines 36-54, Col 9 Lines 39-67 through Col 10 Lines 1-21**). Guo is silent and however does not disclose generating a background correspondence field based on the background images; detecting movable objects in the real-time images based at least in part on the background correspondence field; generating new correspondence data based at least in part on the movable objects.

Hsu discloses generating a background correspondence field based on the background images (**Figs 1-5, Col 1 Lines 52-55, Col 2 Lines 15-40, Col 3 Lines 55-56 and Col 4 lines 14-28**); detecting movable objects in the real-time images based at least in part on the background correspondence field; generating new correspondence data based at least in part on the movable objects (**Col 5 lines 20-27**). Hsu also discloses the warping of the images at (**Col 13 lines 57-58**) and further discloses that the updated correspondence

information is used to generate new reference images to be used in the iterative matching at **(Col 7 lines 58-61)**. Hsu further discloses that the reference image and the sensors images can be accurately aligned using the parametric transformation and the accuracy is up to a sub-pixel value at **(Col 2 lines 5-32)**. Guo and Hsu are from the same field of endeavor and are analogous art, therefore it would have been obvious for one of ordinary skill in the art, at the time the invention was made to have used the teachings of Hsu in the method of Guo for the above reasons.

7. Regarding Claim 9, Guo and Hsu disclose the method of claim 6. Hsu further disclose comprising integrating the new correspondence data into the background correspondence field by updating the parameters (correspondence data and field) to get the minimum error (SSD) at **(Col 10 Lines 25-37)**.

8. Regarding claim 10, Guo and Hsu disclose the method of claim 9. Hsu further disclose comprising repeating the steps of acquiring a pair of real-time images, detecting movable objects, generating new correspondence data, and integrating the new correspondence data in order to refine the background correspondence field at **(Col 10 Lines 25-37)**.

9. Regarding Claim 11, Guo and Hsu disclose the method of claim 10. Hsu further disclose wherein the repeating step **(iterative process)** continues until a

difference (**SSD**) between the new correspondence data and the background correspondence field (**when the optimum image alignment is achieved**) is below a threshold (**value of error parameter in equation 4 at Col 10 Lines 12-37**).

10. Regarding claim 12, Guo and Hsu disclose the method of claim 10. Hsu further disclose wherein the repeating step (**iteratively processing**) continues until a time limit expires (**queries when the error minimization is complete at Col 10 Lines 12-24**).

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guo in view of Hsu and in further view of Brandt et al. (US 6646655) hereafter Brandt.

11. Regarding claim 7, Guo and Hsu disclose the method of claim 6. Guo and Hsu are silent and however do not disclose wherein the detecting step further comprises: warping a first of the real-time image pair into correspondence with a second of the real-time image pair; differencing the warped first real-time image and the second real-time image; and determining that difference values above a threshold correspond to the movable objects.

Brandt discloses wherein the detecting step further comprises: warping a first of the real-time image pair into correspondence with a second of the real-

time image pair; differencing the warped first real-time image and the second real-time image; and determining that difference values above a threshold correspond to the movable objects at **(Col 6 Lines 13-38, Col 6 Lines 48-67, Col 7 Lines 36-67 through Col 8 Lines 1-6)**. Brandt discloses the Slide detector 21, a frame comparator 34, and a camera motion detector 35 outputting a vector 41, foreground change detector 37 in Figs 3-5 which is important in detecting if the captured scene remains unchanged for numbers of frames or not at **(Col 5 Lines 10-28)**. This is important in detecting if there is a change in the foreground or not **(movable object)**. Guo, Hsu and Brandt are from the same field of endeavour and are analogous art, therefore it would have been obvious for one of ordinary skill in the art at the time the invention was made to have used the teachings Brandt in the method as disclosed by Guo and Hsu for the above reasons.

12. Regarding Claim 8, Guo and Hsu disclose the method of claim 6. Guo and Hsu are silent and however do not disclose wherein the generating new correspondence data step further comprises: spatially grouping the detected movable objects; determining a distance between each spatial group and the background; and generating the new correspondence data based at least in part on the distance.

Brandt discloses wherein the generating new correspondence data step further comprises: spatially grouping the detected movable objects **(by a**

bounding box around an area of change between successive frames at (Col 6 Lines 23-24); determining a distance between each spatial group and the background and generating the new correspondence data based at least in part on the distance by a foreground change vector 43 at **(Col 6 Line 22)**.

Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Merchant in view of Hsu and in further view of Brandt

13. Regarding Claim 14, Merchant and Hsu disclose the system of claim 13. Merchant and Hsu are silent and however do not disclose wherein the processor is configured to detect the new objects by: warping a first of the subsequent images captured by a first camera into correspondence with a second of the subsequent images captured by a second camera; computing a difference between elements of the first image and corresponding elements of the second image; and determining that elements associated with difference values above a threshold correspond to new objects.

Brandt discloses wherein the processor is configured to detect the new objects by: warping a first of the subsequent images captured by a first camera into correspondence with a second of the subsequent images captured by a second camera; computing a difference between elements of the first image and corresponding elements of the second image; and determining that elements associated with difference values above a threshold correspond to new objects at

(Col 6 Lines 13-38, Col 6 Lines 48-67, Col 7 Lines 36-67 through Col 8 Lines 1-6). Brandt discloses the Slide detector 21, a frame comparator 34, and a camera motion detector 35 outputting a vector 41, foreground change detector 37 in Figs 3-5 which is important in detecting if the captured scene remains unchanged for numbers of frames or not at **(Col 5 Lines 10-28)**. This is important in detecting if there is a change in the foreground or not **(movable object)**. Merchant, Hsu and Brandt are from the same field of endeavor and are analogous art therefore it would have been obvious for one of ordinary skill in the art at the time the invention was made to have used the teachings of Brandt in the system of Merchant and Hsu for the reasons above.

14. Regarding Claim 15, Merchant and Hsu disclose the system of claim 13. Merchant and Hsu are silent and however do not disclose wherein the processor is configured to generate new correspondence data by: spatially grouping the new objects; determining a distance between each new object spatial group and the background; and generating the new correspondence data based at least in part on the distance.

Brandt discloses wherein the processor is configured to generate new correspondence data by: spatially grouping the new objects **(by a bounding box around an area of change between successive frames at (Col 6 Lines 23-24)**; determining a distance between each new object spatial group and the

background; and generating the new correspondence data based at least in part on the distance by a foreground change vector 43 at **(Col 6 Line 22)**.

15. Regarding Claim 16, Merchant and Hsu disclose the system of claim 13, wherein the cameras are configured to continuously capture images and the processor is configured to continuously generate novel viewpoint images based on the continuously captured images **(as in Fig 3a,3b and Col 3 lines 25-33 of merchant)** and **(Col 6 Lines 36-47 as in Hsu)**.

16. Regarding Claim 17, Merchant, Hsu and Brandt disclose the system of claim 16. Hsu further disclose comprising an output device **(Fig 1 element 114)** configured to output a video signal comprising the continuously generated novel viewpoint images.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH**

shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jayesh A. Patel whose telephone number is 571-270-1227. The examiner can normally be reached on M-F 7.00am to 4.30 pm (5-4-9). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jayesh Patel JP
11/15/07

JINGGE WU
SUPERVISORY PATENT EXAMINER